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(71) Applicant *(for all designated States except US)*: THOMSON CONSUMER ELECTRONICS, INC. [US/US]; 10330 North Meridian Street, Indianapolis, IN 46290 (US).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: GRIMES, Kevin, Lloyd [US/US]; 12427 Haydon Court, Fishers, IN 46038 (US). SCHNEIDEWEND, Daniel, Richard [US/US]; 11221 Tall Trees Drive, Fishers, IN 46038 (US).

(74) Agents: TRIPOLI, Joseph, S. et al.; Thomson Multimedia Licensing Incorporated, P.O. Box 5312, Princeton, NJ 08540 (US).

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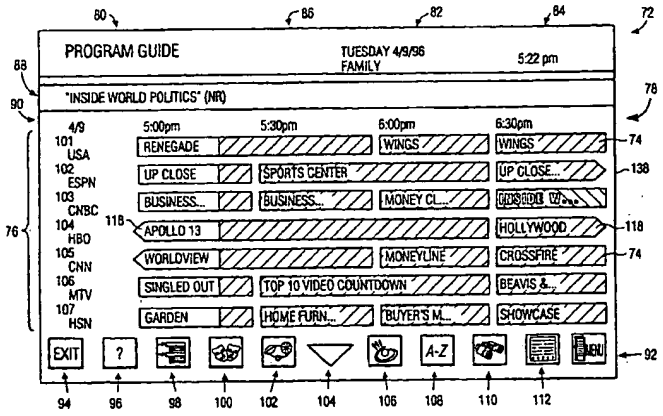

(57) Abstract

An Electronic Program Guide System is capable of displaying an Electronic Program Guide (EPG) that includes a graphical representation of current time in relation to a program time period area to allow a viewer to intuitively assess the current time relative to a particular program which will allow the viewer to also assess time remaining for that program. The graphical representation of current time may be embodied in color change or shading of the program time period area relative to a background, background color change of a graphical time line adjacent to the program time period area, and/or hash/tick marks. Such graphical representation of current time within the program areas and for the program channel program listings is also in relation to an incremental time line that shows the time span of the program listings currently being displayed.

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GRAPHICAL DISPLAY OF CURRENT TIME ON ELECTRONIC PROGRAM GUIDE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to control systems for electronic devices such as televisions and personal computers (PCs) and, particularly, to a control system having a user interface system that provides information to a user and simplifies use of the device. An example of such a user interface is an Electronic Program Guide (EPG) in a television system.

2. Description of the Related Art

An EPG is an interactive, on-screen display feature that displays information analogous to TV listings found in local newspapers or other print media. In addition, an EPG also includes information necessary for collating and decoding programs. An EPG provides information about each program within the time frames covered by the EPG, which typically ranges from the most previous half-hour up through the next seven days. The information contained in an EPG may include programming characteristics such as channel number, program title, start time, end time, elapsed time, time remaining, rating (if applicable), topic, theme, and a brief description of the program's content. EPGs are usually arranged in a two-dimensional table or grid format with time on one axis and channel numbers on the other axis.

Unlike non-interactive guides that reside on a dedicated channel and merely scroll through the current programming on the other channels for the next 2 to 3 hours, EPGs allow viewers to obtain and view programming information in a variety of formats including current channel, partial list of channels, and all channels. Further, EPG features may include the ability to highlight individual cells of the grid containing program information. Once highlighted the viewer can perform functions pertaining to the selected program. For example, the viewer could instantly switch to that program if it is currently being aired. Viewers could also program one touch video cassette recording (VCR) or the like if the television is properly configured and connected to a recording device. Such EPGs are known in the art and described, for instance, in U.S. Patents number 5,353,121; 5,479,268; and 5,479,266 all issued to Young et al., and assigned to StarSight Telecast, Inc.

In addition, US Pat. No. 5,515,106, issued to Chaney et al., and assigned to the same assignee of the present invention, describes in detail an exemplary

embodiment including data packet structure necessary to implement an exemplary program guide system. The exemplary data packet structure is designed so that both the channel information (e.g., channel name, call letters, channel number, type, etc.) and the program description information (e.g., title, rating, star, etc.) relating to a program may be transmitted from a program guide database provider to a receiving apparatus efficiently.

User interfaces such as EPGs are applicable to both analog and digital television systems as well as to other electronic devices such as personal computers. As electronic devices become increasingly complex with a multitude of features, the need for a robust and easy-to-use user interface can not be emphasized enough. For example, separate electronic systems having respective interfaces for controlling features of each system are now being combined into a single system requiring a single user interface. One specific example is the so-called PCTV, which includes features of both a personal computer and a television. The user interface system for such a device must provide both clear communication of computer and television related information and provide for simple control of both computer, including Internet use, and television related features.

SUMMARY OF THE INVENTION

The inventor has recognized limitations in current EPGs. One such limitation is that the current EPGs only indicate the current time in an unrelated graphical or textual format, e.g. 5:55 PM typically in one corner of the display, along with a graphical representation of a selective two-hour time frame. In an exemplary embodiment of known EPG current time displays, the time frame range, usually demarcated by a box or outlined in a particular manner, is preset to display from between the previous one-half hour and the next seven days. Since the EPG typically begins by displaying historical information from the previous one-half hour and is only updated every 30 minutes, a user can not simply determine how much time remains in a particular program. Stated in different terms, the current EPG display may be from either the beginning or the end of the 30-minute update period. The present time is not displayed graphically on the EPG relative to the graphical representation of a program along its graphic time grid, thereby preventing the user to intuitively know the amount of time left on a desired program. Thus the user is relegated to viewing the current time as displayed in one corner of the EPG and then the end time of a subject program.

The present invention teaches a user selectable graphical display for exhibiting the current time in an Electronic Program Guide (EPG) by varying the

color, shading or the like of a portion of the EPG representing a program from the start of that program to the end of that program. In this manner, current time as related to a time scale or program length grid may be intuitively assessed by the viewer.

In a preferred form, the color, shading or the like may include the start of a previous time period e.g., one-half hour, through and including the present time. The user can now easily determine how much time is left in a given program by assessing the location of the proximal edge of the shaded display of the start of the program with respect to the edge, which represents the completion of such program.

The update rate of the graphical representation of the current time can be set to any time, for example, one, three, or six-minute intervals. The user does not have to first read the current time, typically depicted in a textual format in one corner of the display, and then interpret the graphical EPG display to determine the length of time remaining on a given program.

In an alternate embodiment of the present intuitive graphical display for exhibiting current time in an EPG, a tick mark, for example an inverted triangle, may be added within the reference time bar to graphically indicate the present time within the display time window. A vertical "hash mark", for example, a dotted or dashed line, may also be employed either with or without the subject tick mark to also graphically indicate the present time.

BRIEF DESCRIPTION OF THE DRAWINGS

The above-mentioned and other features and advantages of this invention, and the manner of attaining them, will become more apparent and the invention will be better understood by reference to the following description of embodiment(s) of the invention taken in conjunction with the accompanying drawings, wherein:

Fig. 1a is a block diagram of a multi-media system suitable for implementing a user interface system including an EPG, the system processing both analog NTSC (PAL, or other scheme) television signals, and internet information;

Fig. 1b is a block diagram of an MPEG compatible multi-media system for implementing a user interface system including an EPG;

Fig. 2 is an exemplary screen from an EPG in a grid guide viewing mode, showing a two-hour time segment for programs on a plurality of program channels with each program of a program channel represented by essentially a rectangle of a given color on a background color whose length corresponds to a time interval generally equal to the total program time length, wherein color

change or shading is utilized within each rectangle to graphically indicate current time;

Fig. 3 is an exemplary screen from an EPG in a grid guide viewing mode, showing a two-hour time segment for programs on a plurality of program channels with each program of a program channel represented by essentially a rectangle on a background, wherein a background color change or shading is utilized to graphically indicate current time;

Fig. 4 is an exemplary screen from an EPG in a grid guide viewing mode, showing a two-hour time segment for programs on a plurality of program channels with each program of a program channel represented by a rectangle on a background color, wherein a graphical time line with color change or shading is utilized to indicate current time;

Fig. 5A is an exemplary screen from an EPG in a grid guide viewing mode, showing a two-hour time segment for programs on a plurality of program channels, with program time length of each program represented by color change or shaded outlining around each program, wherein vertical hash marks and/or tick marks are used to graphically indicate current time;

Fig. 5B is another type of exemplary screen from an EPG in a grid guide reviewing mode, showing a two-hour time segment for programs on a plurality of program channels, with each program of a program channel represented by essentially a rectangle that is depicted by a graphically induced inset portion, wherein vertical hash marks and/or tick marks are used to graphically indicate current time;

Fig. 6 is an exemplary screen from an EPG in a Detail Guide control panel viewing mode, showing a two-hour time segment for programs on a plurality of program channels on which may be displayed any graphical representation of current time in accordance with the present invention;

Fig. 7 is an exemplary screen from an EPG in SurfGuide control panel viewing mode, showing a two-hour time segment for programs on a plurality of program channels on which may be displayed any graphical representation of current time in accordance with the present invention;

Fig. 8 is a system hardware block diagram of a simplified EPG implementing system that may utilize the present invention;

Fig. 9 is an EPG screen request program flowchart in accordance with the principles of the present invention; and

Fig. 10 is source code of an embodiment for graphically indicating current time on an EPG in accordance with the principles of the present invention.

Corresponding reference characters indicate corresponding parts throughout the several views. The exemplification set out herein illustrates preferred embodiments of the invention, and such exemplification is not to be construed as limiting the scope of the invention in any manner.

DETAILED DESCRIPTION OF THE INVENTION

One example of a television system suitable for providing a user interface such as that referred to above is a television receiver for processing both analog NTSC television signals and internet information such as System 1000 shown in Fig. 1a. System 1000 has a first input 1100 for receiving radio RF television signals from a source such as an antenna or a cable system and a second input 1102 for receiving baseband television signals from, for example, a VCR or a DVD player. As is well known in the art, tuner 1105 and IF processor 1130 operate in a conventional manner for tuning and demodulating a particular television signal at RF_IN input 1100. Although Fig. 1a shows input 1102 as a baseband signal, the television receiver could include a second tuner and IF processor for producing a second baseband video signal from either signal RF_IN or from a second RF signal source. Multiple signal inputs of all kinds may be provided for processing.

Microprocessor (μP) 1110 controls the system by sending and receiving both commands and data via serial data bus I^2C BUS 1170 which utilizes the well-known I^2C serial data bus protocol (or other possible protocol e.g. 1394). Further as is well known in the art, μP 1110 contains central processing unit (CPU) 1112 which is coupled to an external memory device, such as EEPROM 1127 and is responsive to commands provided by a user, e.g. via IR (Infra Red) receiver 1122. Of course, other bus protocols and/or structures may also be utilized. μP 1110 also controls the operation of a communications interface unit 1113 for providing the capability to download and upload information from the Internet, for example. Communication interface unit 1113 includes, for example, a modem for connecting to an Internet service provider, e.g. via a telephone line or via a cable television line. The communications interface unit 1113 provides communication capability and Internet related features such as web browsing in addition to receiving television programming.

CPU 1112 controls well known functions (such as auxiliary data processor 1115 and OSD processor 1117) included within μP 1110 via bus 1119. Auxiliary data processor 1115 extracts auxiliary data such as, for example, StarSight™. StarSight™ data comprises EPG information as described above along with various Internet related information including Internet links. A processor internal to StarSight™ module 1160 formats and

stores the data in memory within itself. In response to the StarSight™ EPG display being activated (e.g., a user activating a particular key on remote control 1125), CPU 1112 transfers formatted StarSight™ EPG display data from StarSight™ module 1160 via I^2C BUS to OSD processor 1117. OSD processor 1117 operates in a conventional manner such that when coupled to a display device, it will produce a displayed image representing on-screen display information such as graphics and/or text comprising an EPG. OSD processor 1117 also produces control signal FSW which is intended to control a fast switch for inserting signals OSD_RGB into the system's video output signal at times when an on-screen display is to be displayed.

Video Signal Processor (VSP) 1155 performs conventional video signal processing functions, such as luma and chroma processing. Output signals produced by VSP 1155 are suitable for coupling to a display device, e.g., a kinescope or LCD device (not shown in Fig.), for producing a displayed image. VSP 1155 also includes a fast switch for coupling signals produced by OSD processor 1117 to the output video signal path at times when graphics and/or text is to be included in the displayed image. The fast switch is controlled by control signal FSW that is generated by OSD processor 1117 in main µP 1110 at times when text and/or graphics are to be displayed. The input signal for VSP 1155 is signal PIPV that is output by picture-in-picture (PIP) processor 1140.

For an EPG display, the display data included in the EPG display is produced by OSD processor 1117 and included in the output signal by VSP 1155 in response to fast switch signal FSW. When µP 1110 detects activation of the EPG display, e.g. when a user presses the appropriate key on remote control 1125, µP 1110 causes OSD processor 1117 to produce the EPG display using information such as program guide data from StarSight™ module 1160. Microprocessor 1110 causes VSP 1155 to combine the EPG display data from OSD processor 1117 and the video image signal in response to signal FSW to produce a display including EPG. The EPG can occupy all or only a portion of the display area.

When the EPG display is active, µP 1110 executes a control program stored in EEPROM 1127. The control program monitors the location of a position indicator, such as a cursor and/or highlighting, in the EPG display. A user controls the location of the position indicator using, for example, direction and selection keys of remote control 1125. Alternatively, the system could include a mouse device. Microprocessor 1110 detects activation of a selection device, such as clicking a mouse button, and evaluates current cursor location

information in conjunction with EPG data being displayed to determine the function desired, e.g., tuning a particular program. Microprocessor 1110 subsequently activates the control action associated with the selected feature.

Another example of an electronic device implementing a user interface system is a system for processing digital video and audio signals such as an MPEG compatible system for receiving MPEG encoded transport streams representing broadcast programs. User interface systems are also applicable to other types of digital signal processing devices including non-MPEG compatible systems, involving other types of encoded data streams. For example, other devices include digital video disc (DVD) systems, digital video computer and television functions such as the so-called "PCTV", and High Definition Television (HDTV) receiver.

Fig. 1b shows another example of an electronic device capable of processing and customizing program guide information in accordance with the present invention. As described below, the exemplary system shown in Figure 1b is an MPEG compatible system for receiving MPEG encoded transport streams representing broadcast programs. User interface systems are also applicable to other types of digital signal processing devices including non-MPEG compatible systems, involving other types of encoded datastreams. Further, although the system described below is described as processing broadcast programs, this is exemplary only. The term 'program' is used to represent any form of packetized data such as digital video and/or audio information received via cable, telephone messages, computer programs, Internet data, audio presentations (e.g., from a remote source or from a local source, such as a compact disk or other audio medium), visual presentations, audiovisual presentations (e.g., from a remote source or a local source, such as a compact disk or other audio medium), or other communications, for example.

Video and audio decoders 21 and 23 respectively, decode the compressed data from transport system 25 to provide outputs for display. A data port provides an interface for communication of the compressed data from transport system 25 to other devices such as a computer or High Definition Television (HDTV) receiver, for example. Storage device 31 stores the compressed data from transport system 25 on storage medium 33. Device 31, in a playback mode also supports retrieval of the compressed data from storage medium 33 for processing by transport system 25 for decoding, communication to other devices or storage on a different storage medium (not shown to simplify drawing).

Considering Figure 1b in detail, a carrier modulated with video and/or audio data received by antenna 10, is converted to digital form and processed by input processor 15. Processor 15 includes radio frequency (RF) tuner and intermediate frequency (IF) mixer and amplification stages for down-converting the input video signal to a lower frequency band suitable for further processing. The resultant digital output signal is demodulated by demodulator 16 and decoded by decoder 17. The output from decoder 17 is further processed by transport system 25 which is responsive to commands from remote control unit 1125. Transport system 25 provides compressed data outputs for storage, further decoding, or communication to other devices.

The data provided to transport system 25 is in the form of an MPEG compliant packetized transport datastream as defined in MPEG systems standard section 2.4 and includes program guide information and the data content of one or more program channels. The individual packets that comprise particular program channels are identified by Packet Identifiers (PIDs). The transport stream contains Program Specific Information (PSI) for use in identifying the PIDs and assembling individual data packets to recover the content of all the program channels that comprise the packetized datastream. Transport system 25, under the control of the system controller 27, acquires and collates program guide information from the input transport stream, storage device 31 or an Internet service provider via the communication interface unit 1113. The individual packets that comprise either particular program channel content or Program Guide information, are identified by their Packet Identifiers (PIDs) contained within header information. As discussed above, the program description may comprise different program descriptive fields such as title, star, rating, etc., relating to a program.

The user interface incorporated in the video receiver shown in Figure 1b enables a user to activate various features by selecting a desired feature from an on-screen display (OSD) menu. The OSD menu includes an electronic program guide (EPG) as described above and other features discussed below. Data representing information displayed in the OSD menu is generated by system controller 27 in response to stored program guide information, stored graphics information, and/or program guide and graphics information received via the input signal as described above. A software control program may be stored, for example, in embedded memory (not shown) of system controller 27.

Using remote control unit 1125 (or other selection means such as a mouse) a user can select from the OSD menu items such as, for example, an icon to be selected, a program to be viewed, a program to be stored, the type of

storage media and manner of storage, and scrolling of the EPG. System controller 27 uses the selection information, provided via remote unit interface 29, to configure transport system 25 to select the programs for storage and display and to generate PSI suitable for the selected storage device and media. The operation of the other well known functions of transport system 25 illustrated in Figure 1b are unnecessary to understand or practice the present invention and thus are not discussed herein.

With reference now to Fig. 2 there is depicted exemplary EPG screen display 72. Screen display 72 is in grid guide mode wherein programs 74 for a given time period for a given number of program channels 76 are displayed along time indicator line 78. Individual programs 74 are depicted horizontally adjacent its corresponding channel 76 which channel or channels shown on EPG screen 72 being dependent upon user selection and/or system default(s). In Fig. 2, programs 74 are delineated by rectangular program areas that are usually colored or shaded relative to background 138 color. The horizontal length of a program corresponds to an incremental time period along time indicator line 78. Since programs generally have a program length in 30 and/or 60-minute increments, program rectangles or boxes may be 30 minutes, 60 minutes, 90 minutes, etc., but, here are one-half hour. Time indicator line 78 is thus depicted in one-half hour segments. Title information is presented inside the program area. Programs extending more than one-half hour are represented by continuously connected one-half hour increment boxes, the total number of which corresponds to the total time length of the particular program. Start and stop times are indicated by vertical end lines at the beginning and end of the program area corresponding to the particular program. Where a program spans more in time length than the two-hour time length window of the EPG, end arrows 118 substitute for the vertical end line. The pointing direction and placement of an arrow 118 is dependent on whether the program started before or after the two-hour (or any segment length) time span of the EPG. A left pointing arrow in substitute for a left vertical end line indicates that the program started before the earliest time indicated on time indicator line 78. A right pointing arrow in substitute for a right vertical end line indicates that the program will continue beyond the latest time indicated on time indicator line 78. Because the various programs are displayed along an axis (vertical) representing channel 76 and an axis (horizontal) representing time increments 78, such display is termed the grid mode (Grid Guide) control panel display. The grid mode control panel may display seven program channels spanning a

two-hour time slot and covers the entire screen of the display unit; any number of program channels may be displayed.

In addition to the above, screen display 72 further displays the program guide name 80, current date information 82, time in text format 84, viewing category type 86, highlighted program title 88, and viewing guide date 90. Displayed channels 76 may include channel identification letters such as, for example "HBO", "CNBC", "MTV", below the channel number to assist the viewer in readily identifying a desired channel by name. Located along the bottom portion of screen display 72 is menu 92 having a MENU icon. The menu allows access to EPG capabilities and functions. A cursor (not shown) if implemented by the EPG system, may be used to access various Internet capabilities and other EPG/Internet functions via various icons located on menu 92. Instead of a cursor, arrow keys on a remote control or similar device may be used to select a function corresponding to a displayed icon.

Exemplary icons and their functions/actions as depicted on EPG screen display 72 are: EXIT icon 94 that allows the user to exit the program guide; "?" icon 96 that provides help for the user; User Preference icon 98 that selects user defined program listings and/or internet related resources; Movie icon 100 that selects movie program listings and/or internet related resources; Sports icon 102 that selects sports program listings and/or internet related resources; Down arrow icon 104 that provides page down for the next page of items in the current guide; All Programs icon 106 that selects listings of all programs available; Alphabetic (Alpha) icon 108 that selects alphabetic program listings; Scout icon 110 that selects results from user defined keyword search on future program listings; and Other Guide icon 112 that selects other guide display formatted program listings.

In accordance with an aspect of the present invention, since the current time of 5:22 PM, as indicated by current time text display 84, is within the current program time period, i.e. 5:00 PM until 7:00 PM, shown on time indication line 78 for the program listings currently being shown, the current time is graphically represented on the EPG screen display 72. Additionally, current date 82 may be compared to viewing date 90 to determine if the dates coincide for depicting the present graphical current time. In Fig. 2, the graphical representation of current time is effected by a color change, shading, or the like, in the program area defined for the particular program(s) extending from program start to current time as indicated on time indication line 78 if current time is within the displayed time period. EPGs usually have the ability to not only scroll up and down the program listings, but to also move the program listings left and right

along the time axis (time indication line 78) to effect incremental time period shift (viewing time shift). The color change direction coincides with the direction of time along time grid 78. Here the color change begins along the left side or beginning of the program area and is continuous therefrom until the point of current time, which is before the program area ends, or the end of the program. The color change, shading, or the like, may be linear or not, and may be a single or multi color/shading, as long as it provides a contrast to background 78.

As examples, the program "Renegade" on channel 101 (USA) begins at 5:00 PM indicated by a left vertical start line of the program area therefor approximately below 5:00 PM on time indication line 78, and ends at 6:00 PM indicated by a right vertical end line of the program area therefor approximately below 6:00 PM on time indication line 78. The color change area for "Renegade" thus begins at the left vertical start line of the program area thereof and extends a horizontal distance therealong corresponding in length to twenty-two (22) minutes (5:00 + 0:22 = 5:22 = current time), and thus ends at the right vertical end line a distance before 5:30 PM on time indication line 78. The program "Apollo 13" on channel 104 (HBO) began before 5:00 and ends at 6:30 PM. Thus, there is a left-pointing arrow at the left (program start) side of the program area for "Apollo 13" to indicate that the program began before the time period currently being viewed and a vertical end line at the right (program end) side approximately below 6:00 on time grid 78. The color change area for "Apollo 13" thus begins at 5:00 PM on time grid 78 and extends a distance signifying twenty-two (22) minutes past the 5:00 PM demarcation on time indication line 78. Of course, in like manner but opposite thereto, a right pointing arrow indicates that the program will end after the time period currently being viewed.

With reference to Fig. 3, there is shown another manner of graphically representing current time on an EPG. EPG screen display 114 shows programs 74 listed for various channels 76 along time indication line 78 and thus is in the grid guide mode. Again, the time period for the program listings currently being viewed is two hours, specifically 5:00 PM to 7:00 PM. EPG screen display 114 provides essentially the same features/capabilities as EPG screen display 72. However, with EPG screen display 114 background color change or shading is used as the graphical representation to indicate current time for the programs adjacent appropriate program area. In one embodiment, background color change is identifiable via color areas or bars 116 adjacent and above the program area and correspondingly below time indicator line 78.

In Fig. 4, there is shown another manner of graphically indicating current time on an EPG. EPG screen display 120 again shows program 74 listings for various channels 76 along a time indication line 78 and thus is in the grid guide mode. EPG screen display 120 provides essentially the same features/capabilities as EPG screen displays 72 and 114. However, here time bar 122 is disposed below time indication line 78. A color change or shading within time bar 122 with respect to background 38 is used as the graphical representation to indicate current time for the program listing. The color change is identifiable within time bar 122 above the corresponding program area(s) and below the time indication line 78.

In Fig. 5A there is shown a further manner of graphically representing current time on an EPG. EPG screen display 124 again shows program 74 listings for various channels 76 along time indication line 78 and thus is in the grid guide mode. EPG screen display 124 provides essentially the same features/capabilities as the previous EPG screen displays of Figs. 2-4. However, here a vertical hash mark 128 for each horizontal channel program listing corresponds to current time and is situated appropriately below time indication line 78. Tick mark 126, here a triangle, may be used as the graphical representation to indicate current time for the programs in the same manner as the hash marks. The tick marks 126 and the hash marks 128 correspond to the current time, and relative to time indication line 78. Thus, relative position of the tick marks and the hash marks relative to time indication line 78 provide the present intuitive current time in graphical form.

In Fig. 5B there is shown an EPG display screen 140 in which programs 74 are within program areas defined by graphically produced inset areas. For the graphically depiction of current time, hash marks 128 and tick marks 126 are used in the same manner as that defined in conjunction with Fig. 5A.

In operation of the exemplary multi-media system providing such an EPG, activating an EPG feature button by, for example, pressing a GUIDE key from DSS viewing (or selecting "Program Guide" from a Main Menu) may display the program guide (EPG) in a Detail Guide control panel mode. Pressing the GUIDE key a second time may display the program guide in a Surf Guide mode, while pressing the GUIDE key again may display the program guide in the Grid Guide mode. In the Grid Guide, Detail Guide, and SurfGuide modes, a vertical line (78) indicates the current time.

In Fig. 6, a detail guide mode EPG screen display 128 is depicted. In the detail guide mode, the format of the EPG may be changed to display five channels 76 spanning a two-hour time slot/time grid 78, five lines of description

130 on the highlighted program, and the other information as described above. In the detail guide mode, a secondary highlight remains on the last highlighted program when a user moves to softkeys. The program information for that program remains visible, even if the user scrolls the guide down, the secondary highlight also scrolls so that it remains on the bottom line of the program area. EPG screen display 128 is depicted to show that other types of screen displays can utilize the graphical representation(s) of current time as described above in accordance with the principles of the present invention.

Fig. 7 depicts EPG screen display 132 for an EPG in a SurfGuide mode where the interactive channel banner is not displayed. However, EGP screen 132 does include program guide name 80, viewing guide date 90, channels 76 and time grid 78. While in the SurfGuide mode, live video is displayed in video display area 134 located within the screen display. The live video may be a highlighted program, Internet display, or other video signal supplied thereto. Additionally, title 136 may be displayed on a lower portion of the screen. Title 136 may be to a highlighted program, to the video within video display area 134, or other video feed.

It should thus be appreciated from the foregoing that the style of EPG screen display may be used with any style of graphical representation of current time within the program listings. Therefore, any manner of graphical representation of current time in accordance with the principles of the present invention may be used with any manner of representation of program areas.

Referring now to Figure 8, there is shown a simplified system hardware block diagram delineating a configuration of a system that can generate EPGs, especially EPGs with the various functions and capabilities as indicated above and in accordance with the principles of the present invention as indicated herein. Tuner/Receiver 20 receives input audio and/or video signals from a variety of sources, both terrestrial and satellite in known ways, and provides the same to demultiplexer 24 via communication/data bus 22. Demultiplexer 24 demultiplexes the incoming signals from tuner/receiver 20 and sends the video portion containing the video of the chosen program of the incoming signals to video decoder 26 via communication/data bus/line 28. Video decoder 26, under direction from microprocessor 34 via communication/data line 38, provides the decoded signals to display 30 via communication/data line 32. Demultiplexer 24 is in communication with microprocessor 34 via communication/data line 36 for control of video decoder 26.

Demultiplexer 24 also stores in memory 46 via communication/data line 50 another portion of the demultiplexed incoming signal relating to EPG data

under direction of microprocessor 34. The EPG data is stored in memory 46 until such data is needed. Microprocessor 34 is under direction of stored program 42 via communication/data line 44. EPG data stored in memory 46 is provided to video decoder 26 for showing on display 30 when display 30 is in an EPG display mode. Display 30 is also in communication with microprocessor 34 via communication/data line 40.

In one embodiment, tuner/receiver 20 tunes to the channel broadcasting StarSight™ (EPG) data during a particular time dependent upon program 42. During data reception, demultiplexer 24 under control by microprocessor 34 under direction by program 42, stores the EPG data in memory 46. During viewing, demultiplexer 24 provides video information to video decoder 26 and display 30 also under control by microprocessor 34. Upon activation, EPG data from memory 46 is displayed on display 30 including the present graphical representation of current time.

Figure 9 depicts simplified flowchart 52 defining a functionality of software for generating an EPG in accordance with the present invention that can be used with the system depicted in Fig. 8 and additional reference is now made thereto. Activation of the EPG may occur when a user presses an appropriate EPG key such as a GUIDE key from a direct broadcast system (DBS) viewing display via a remote, or other similar manner. Upon activation of an EPG mode by the user, microprocessor 34 under control of program 42, receives Program Guide Screen Request 54 and begins to determine various parameters (e.g., Program Guide Time Boundaries; Current Screen Time Boundaries; and Current Time) 56 for depiction on display 30. After these parameters have been determined, program 42 determines if the Current Time is within the Current Screen Time Boundaries 58 for the programs to be/being displayed on display 30. If the Current Time is not within the Current Screen Time Boundaries, the viewer is looking at future programming on the grid, and no current time needs to be represented. After a "no" determination the program draws the On-Screen Program Guide 60. If however, the Current Time is within the Current Screen Time Boundaries 58, then the Current Time is converted into a horizontal (or vertical) Screen Pixel Position using the same transfer function used for Programs or Events in the Program Guide display 62. After conversion 62, the Screen Pixel Position is used to draw a graphical representation of Current Time in the correct location or program box on the grid of the Program Guide 64. Thereafter, the On-Screen Program Guide is drawn 60 on display 30 and the program continues as normal 66.

Figure 10 is an exemplary software listing designed to implement the functions shown in flowchart 52 of Figure 9. Source code 70 thus determines various parameters 56 (program guide and current screen time boundaries and current time) and determines whether the current time is within the current screen time boundaries 58, indicating that the user is looking at a listing of shows currently being shown on display 30. Thereafter, source code 70 generates and places a graphical representation of current time into the EPG channel/program versus time grid.

In one embodiment of a multi-media system such as a DBS system, program guide information is continuously transmitted to the DBS system and is updated from the DBS; a DBS system may support multiple guides. A Master Program Guide is transmitted on all transponders; other guides may be transmitted on other transponders and are mapped from the master program guide. The master program guide contains a listing of all current programming, while the other guides may be used for future programming.

While this invention has been described as having a preferred design, the present invention can be further modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains and which fall within the limits of the appended claims.

WHAT IS CLAIMED IS:

1. A method for generating an on-screen program guide comprising:

(a) determining the current time;

(b) producing a signal suitable for displaying on a display device program related information received from a signal containing program data; and

(e) graphically indicating the current time in conjunction with said displayed program related information.

2. The method of claim 1, further comprising displaying on the display device a current time grid corresponding in length to a given period of time in conjunction with said graphical display of current time.

3. The method of claim 1, further comprising continually updating said graphical representation of current time and periodically updating said program related information of said selected category of programs.

4. The method of claim 3, wherein graphically indicating the current time comprises displaying a graphic indicator of the current time in relation to a time axis of said program related information and shading a portion of the graphic indicator of the current time as a function of program start time to current time.

5. The method of claim 3, wherein graphically indicating the current time comprises shading a portion of said program related information, said shaded portion corresponding to the current time.

6. The method of claim 3, wherein graphically indicating the current time comprises shading a separate region that is adjacent to said program related information, said shaded separate region corresponding to the current time.

7. The method of claim 6, wherein graphically indicating the current time comprises shading a plurality of separate regions that are adjacent to said program related information, said shaded separate regions corresponding to the current time.

8. An apparatus for the display of an electronic program guide (EPG) comprising:

a display device;

a receiver in communication with said display device and adapted to receive and store program related information from a program related information signal; and

a controller in communication with said receiver and comprising;

an extraction circuit adapted to extract a portion of said program related information, said receiver adapted to display said extracted portion of said program related information on the display device;

a time determining circuit adapted to determine current time; and

means for graphically indicating said determined current time on said display device in conjunction with said program related information.

9. The apparatus of claim 8, wherein said time determining circuit continually determines and updates the current time.

10. The apparatus of claim 9, wherein said indicating means shades a portion of said program related information.

11. The apparatus of claim 9, wherein said indicating means generates an indicator of the current time that is displayed in relation to a time axis of said program related information.

12. The apparatus of claim 9, wherein said indicating means shades a separate region that is adjacent to said program related information.

13. The apparatus of claim 13, wherein said indicating means shades a plurality of separate regions that are adjacent to said program related information.

14. The apparatus of claim 8, wherein said extraction circuit extracts a portion of said program related information in response to a user request.

15. The apparatus of claim 8, wherein said extraction circuit extracts a portion of said program related information in response to a preset time.

16. A method for generating a program guide on a display device, the method comprising:

receiving a signal having program related information;

selecting a category of available programs within a time period from a signal containing program data;

extracting program related information from the program data signal corresponding to the selected category of available programs within a time period;

determining current time;

displaying on the display device said program related information of said selected category of available programs within a time period;

displaying on the display device a time grid encompassing the current time; and

graphically indicating on the display device the current time in conjunction with said displayed program related information of said selected category of available programs and said time grid.

17. The method of claim 16, further comprising continually updating said graphical representation of current time and periodically updating said program related information of said selected category of programs.

18. The method of claim 16, wherein graphically indicating the current time comprises graphically shading a portion of said program related information on the display device, wherein the shaded portion corresponds to current time.

19. The method of claim 16, wherein graphically indicating the current time comprises shading a separate region that is adjacent to said program related information on the display device, the shaded portions corresponding to the current time.

20. The method of claim 19, wherein graphically indicating the current time comprises shading a plurality of separate regions that are adjacent to said program information on the display device.

21. A method for generating an on-screen program guide comprising:

(a) determining the current time;

(b) producing a signal suitable for displaying on a display device program related information received from a signal containing program data; and

(e) graphically indicating the relationship of the current time to a duration of a program included in said program related information.

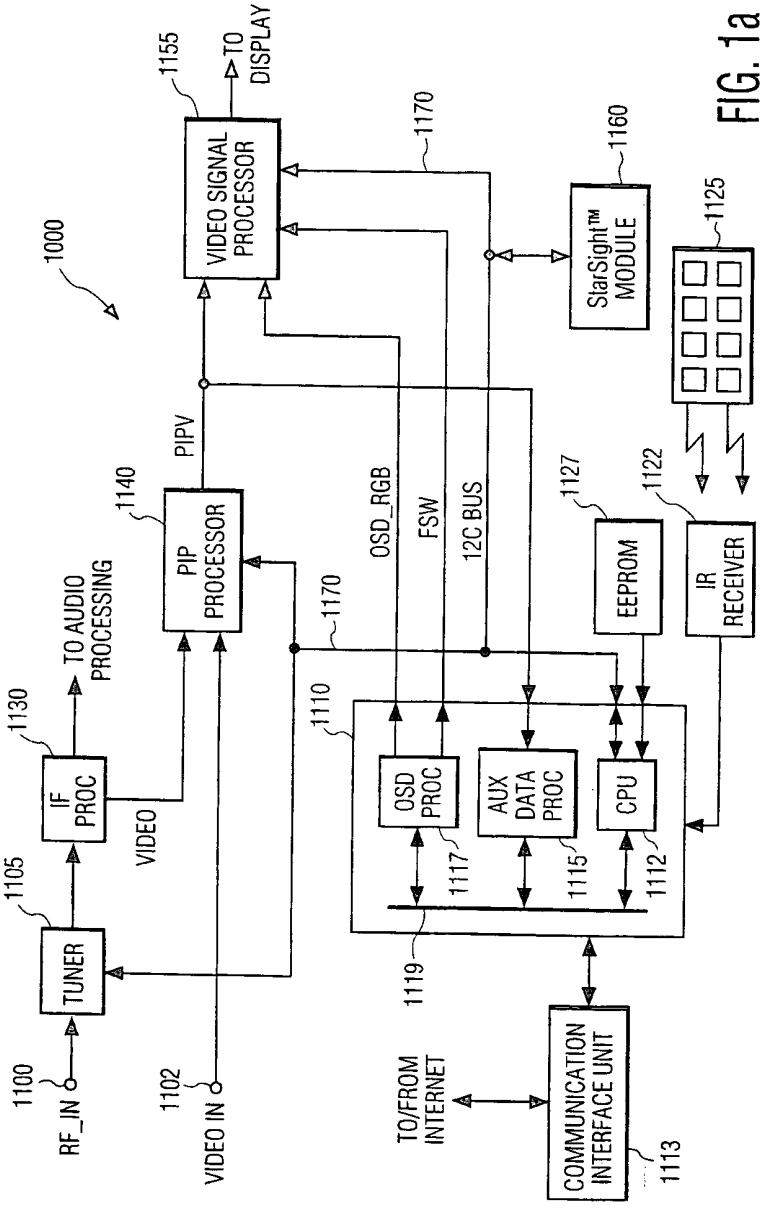
1000
1155
TO DISPLAY
VIDEO SIGNAL PROCESSOR
1170
1160
StarSight™ MODULE
1125
PIPV
1140
PIP PROCESSOR
OSD_RGB
FSW
12C BUS
1127
EEPROM
1122
IR RECEIVER
TO AUDIO PROCESSING
1130
IF PROC
VIDEO
1110
OSD PROC
AUX DATA PROC
CPU
1105
TUNER
1117
1115
1112
1119
1100
RF_IN
1102
VIDEO IN
TO/FROM INTERNET
COMMUNICATION INTERFACE UNIT
1113

FIG. 1a

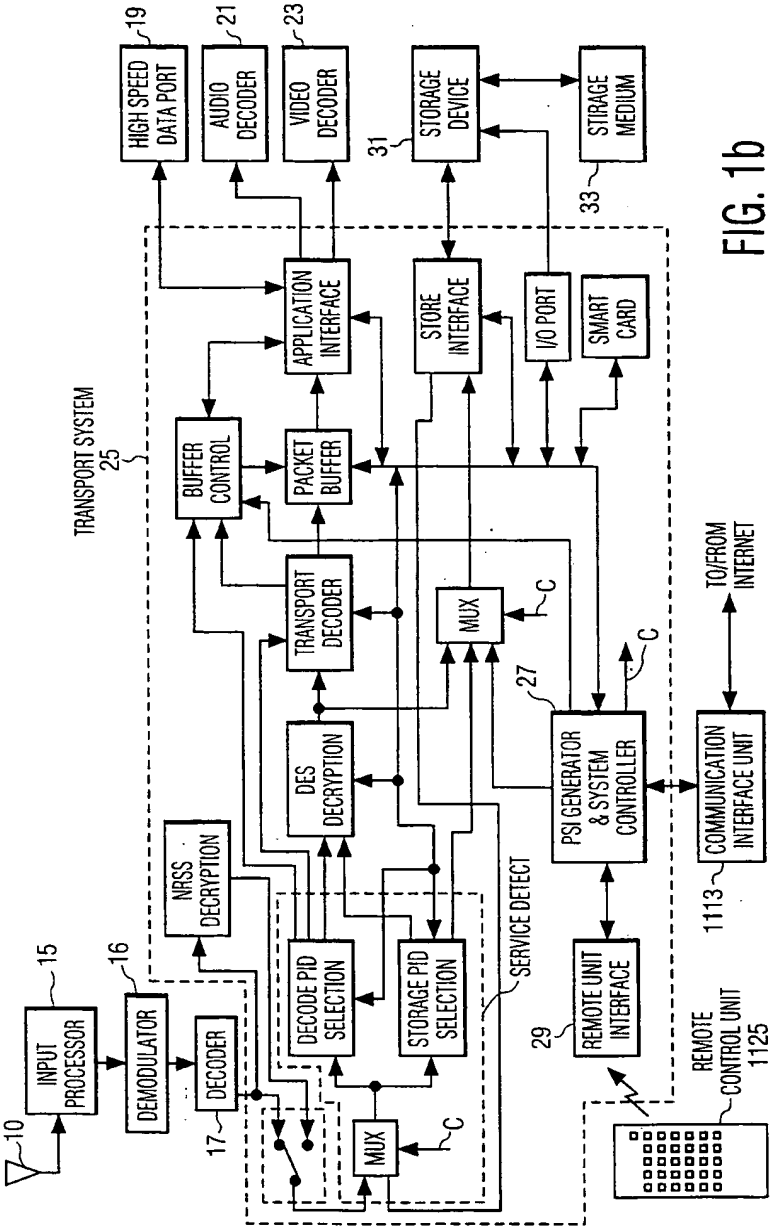
HIGH SPEED DATA PORT
19
AUDIO DECODER
21
VIDEO DECODER
23
STORAGE DEVICE
31
STIRAGE MEDIUM
33
TRANSPORT SYSTEM
25
APPLICATION INTERFACE
STORE INTERFACE
I/O PORT
SMART CARD
BUFFER CONTROL
PACKET BUFFER
TRANSPORT DECODER
MUX
C
TO/FROM INTERNET
27
DES DECRYPTION
PSI GENERATOR & SYSTEM CONTROLLER
COMMUNICATION INTERFACE UNIT
1113
NRSS DECRYPTION
SERVICE DETECT
DECODE PID SELECTION
STORAGE PID SELECTION
REMOTE UNIT INTERFACE
29
REMOTE CONTROL UNIT
1125
INPUT PROCESSOR
15
DEMODULATOR
16
DECODER
17
10

FIG. 1b

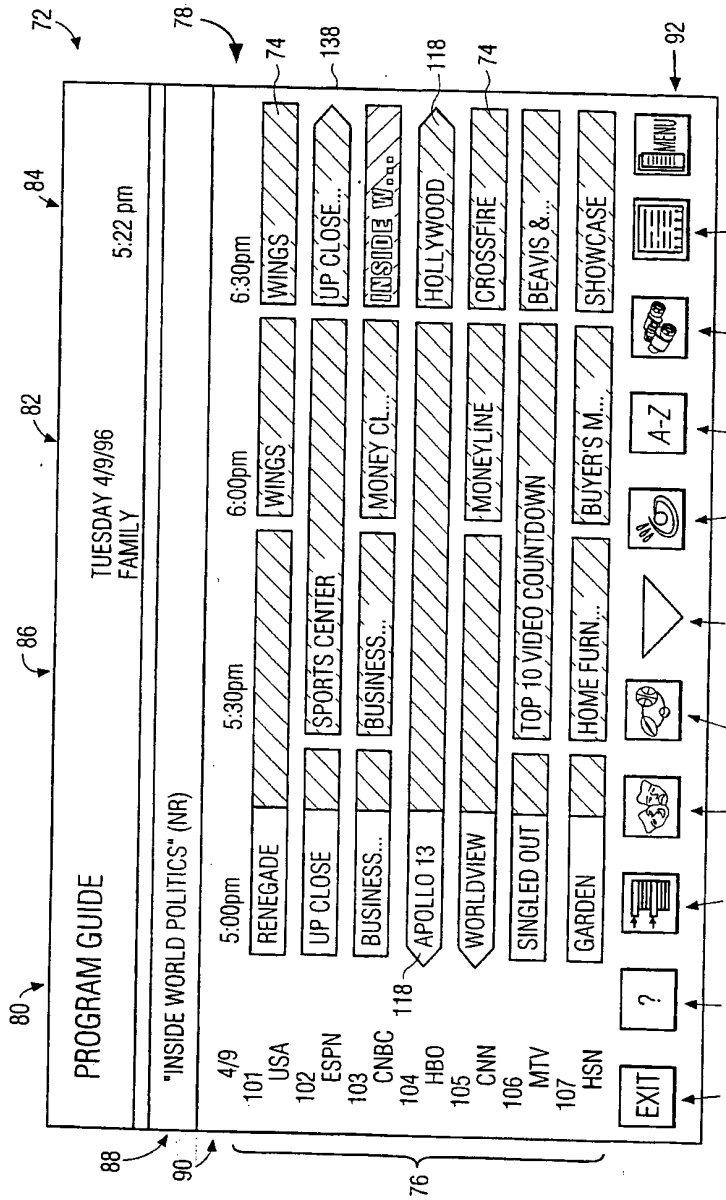

FIG. 2

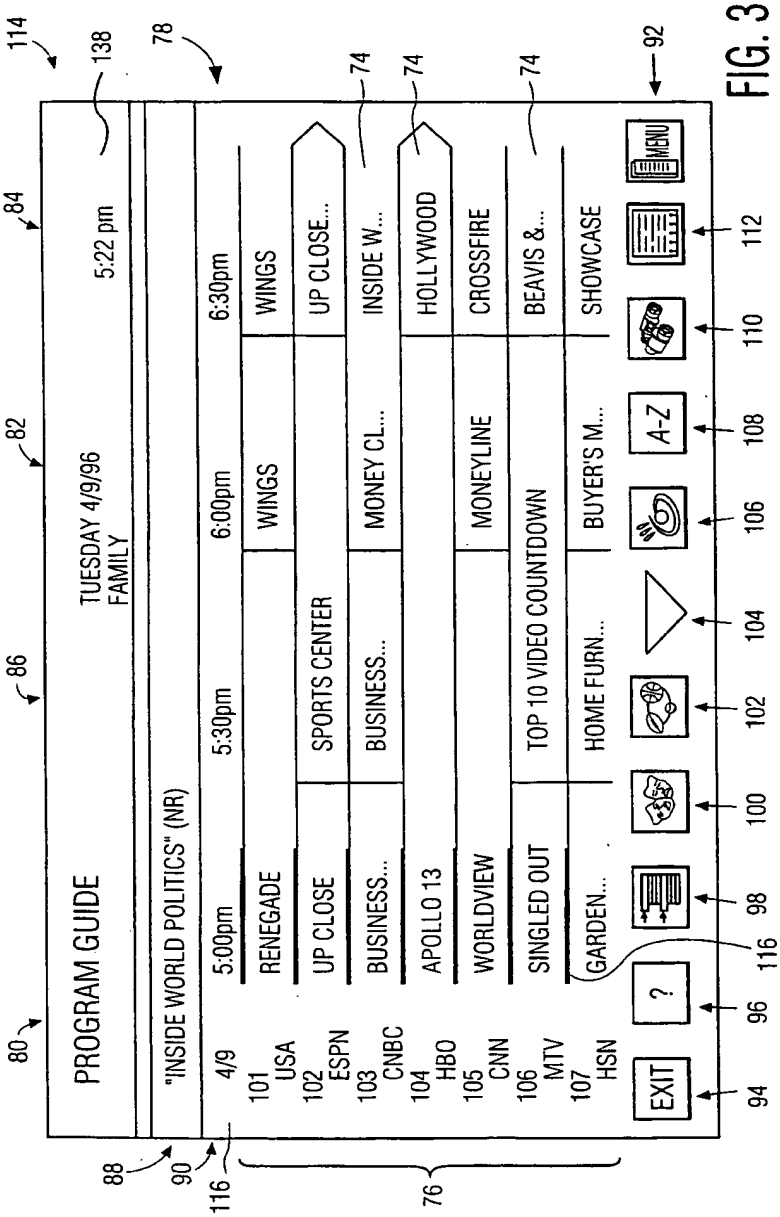
PROGRAM GUIDE
TUESDAY 4/9/96
FAMILY
5:22 pm
"INSIDE WORLD POLITICS" (NR)
4/9
5:00pm
5:30pm
6:00pm
6:30pm
101 USA
RENEGADE
WINGS
WINGS
102 ESPN
UP CLOSE
SPORTS CENTER
UP CLOSE...
103 CNBC
BUSINESS...
BUSINESS...
MONEY CL...
INSIDE W...
104 HBO
APOLLO 13
HOLLYWOOD
105 CNN
WORLDVIEW
MONEYLINE
CROSSFIRE
106 MTV
SINGLED OUT
TOP 10 VIDEO COUNTDOWN
BEAVIS &...
107 HSN
GARDEN...
HOME FURN...
BUYER'S M...
SHOWCASE
EXIT
?
A-Z
MENU
80
82
84
86
88
90
92
94
96
98
100
102
104
106
108
110
112
114
116
138
78
74
74
74
76
116

FIG. 3

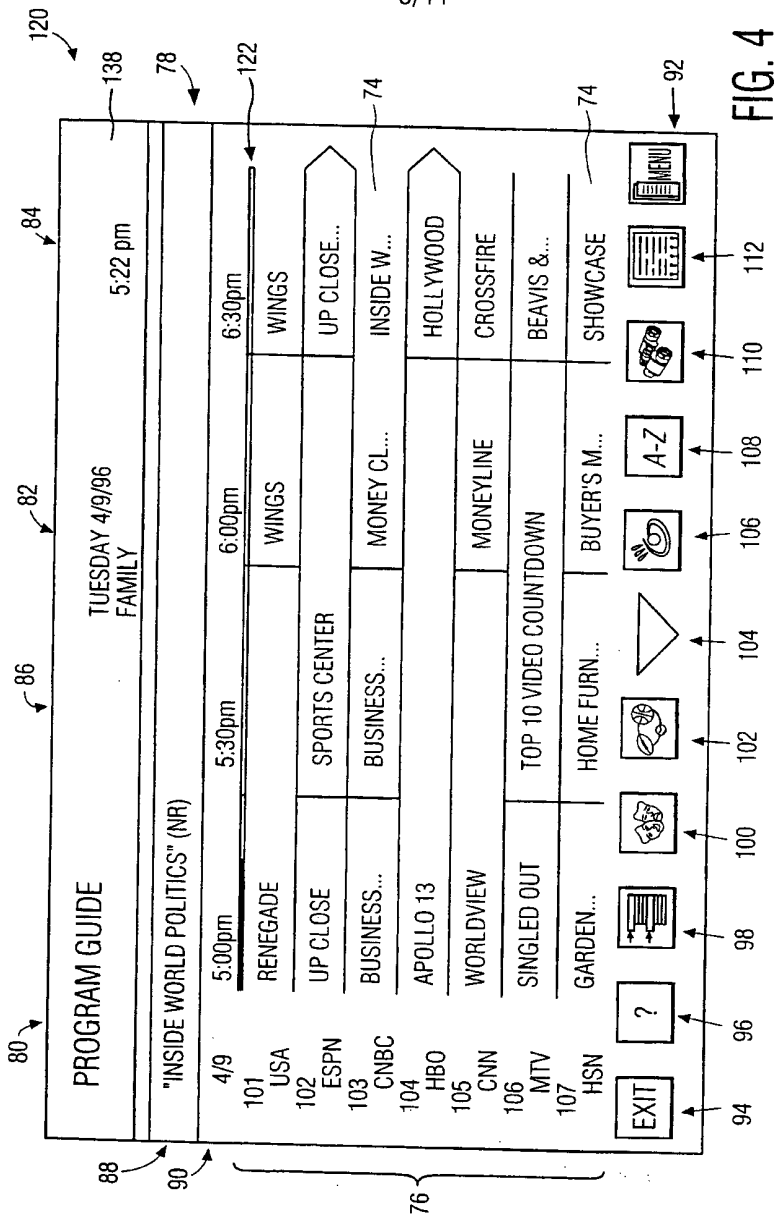

FIG. 4

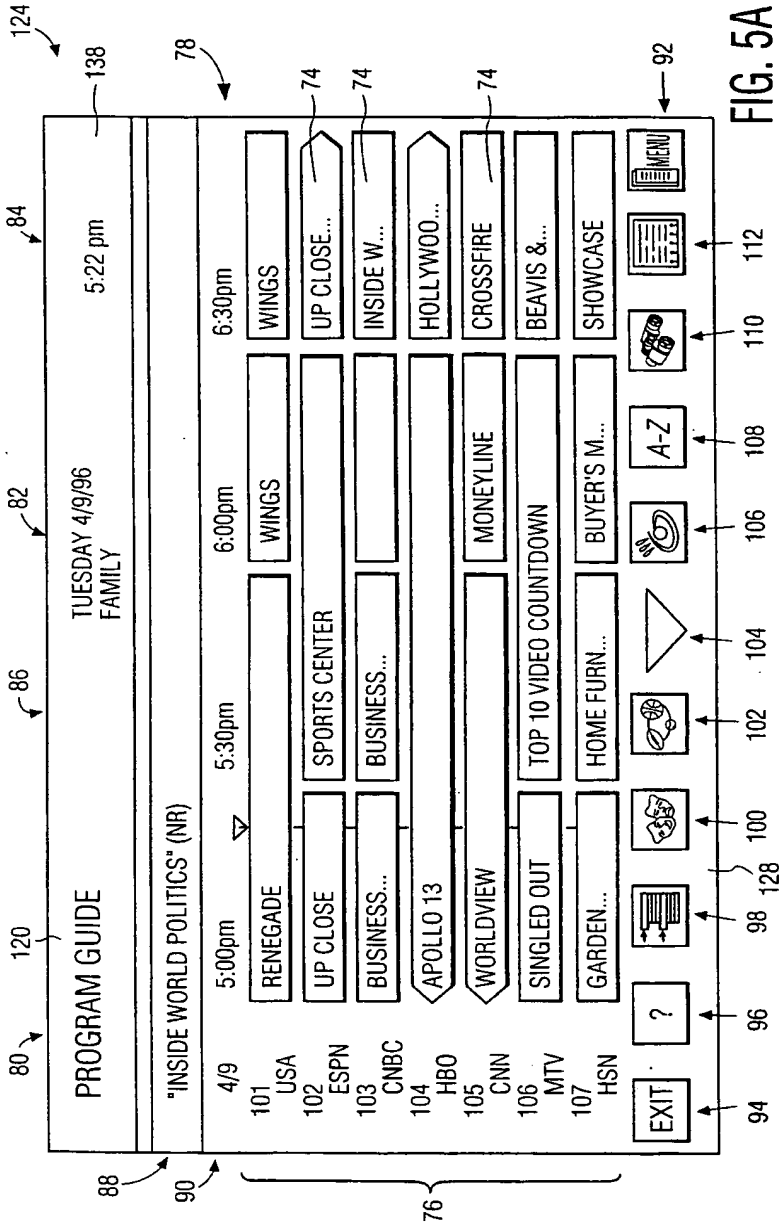
PROGRAM GUIDE
TUESDAY 4/9/96
FAMILY
5:22 pm
"INSIDE WORLD POLITICS" (NR)
4/9
5:00pm
5:30pm
6:00pm
6:30pm
101 USA
102 ESPN
103 CNBC
104 HBO
105 CNN
106 MTV
107 HSN
RENEGADE
UP CLOSE
BUSINESS...
APOLLO 13
WORLDVIEW
SINGLED OUT
GARDEN...
WINGS
SPORTS CENTER
BUSINESS...
MONEYLINE
TOP 10 VIDEO COUNTDOWN
HOME FURN...
BUYER'S M...
WINGS
UP CLOSE...
INSIDE W...
HOLLYWOO...
CROSSFIRE
BEAVIS &...
SHOWCASE
EXIT
?
A-Z
MENU
80
120
86
82
84
124
138
78
74
74
74
92
88
90
76
94
96
98
128
100
102
104
106
108
110
112

FIG. 5A

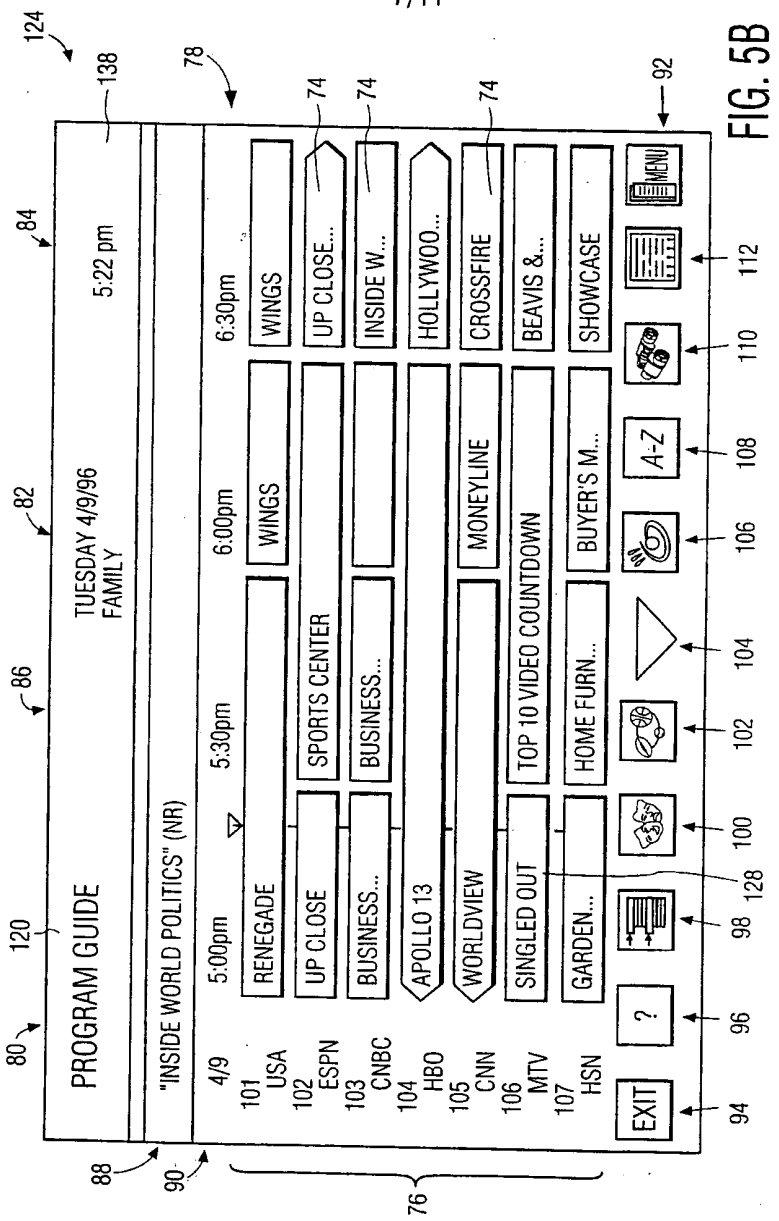

FIG. 5B

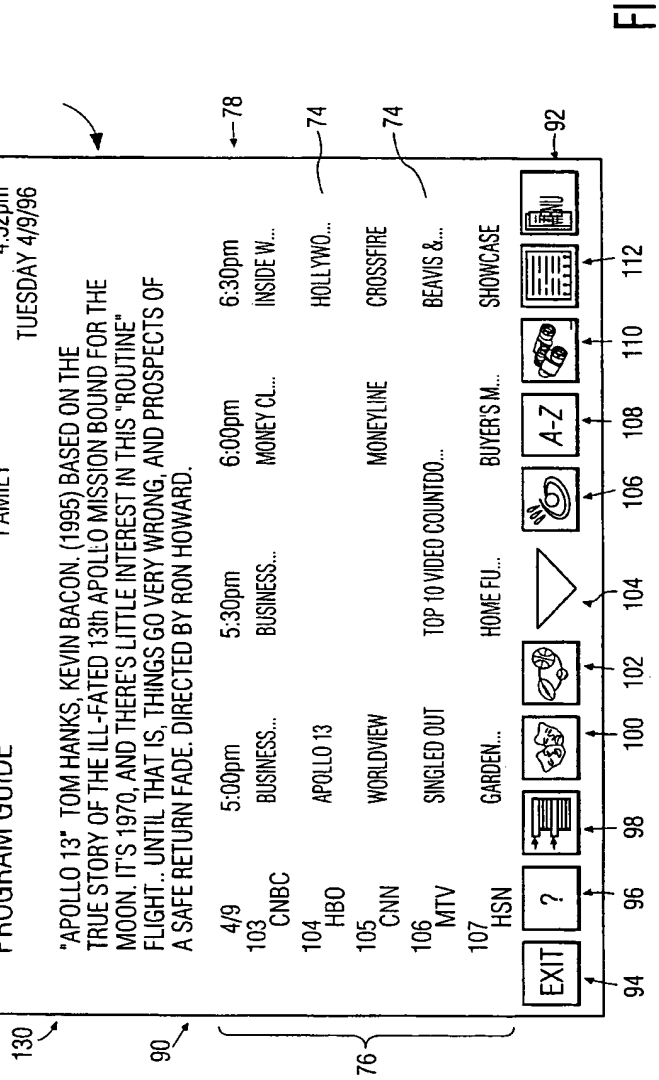
128
80
86
82
84
PROGRAM GUIDE
FAMILY
4:52pm
TUESDAY 4/9/96
"APOLLO 13" TOM HANKS, KEVIN BACON. (1995) BASED ON THE TRUE STORY OF THE ILL-FATED 13th APOLLO MISSION BOUND FOR THE MOON. IT'S 1970, AND THERE'S LITTLE INTEREST IN THIS "ROUTINE" FLIGHT.. UNTIL THAT IS, THINGS GO VERY WRONG, AND PROSPECTS OF A SAFE RETURN FADE. DIRECTED BY RON HOWARD.
78
74
74
92
4/9 5:00pm 5:30pm 6:00pm 6:30pm
103 CNBC BUSINESS... BUSINESS... MONEY CL... INSIDE W...
104 HBO APOLLO 13 HOLLYWO...
105 CNN WORLDVIEW MONEYLINE CROSSFIRE
106 MTV SINGLED OUT TOP 10 VIDEO COUNTDO... BEAVIS &...
107 HSN GARDEN... HOME FU... BUYER'S M... SHOWCASE
EXIT
?
A-Z
94 96 98 100 102 104 106 108 110 112
130
90
76

FIG. 6

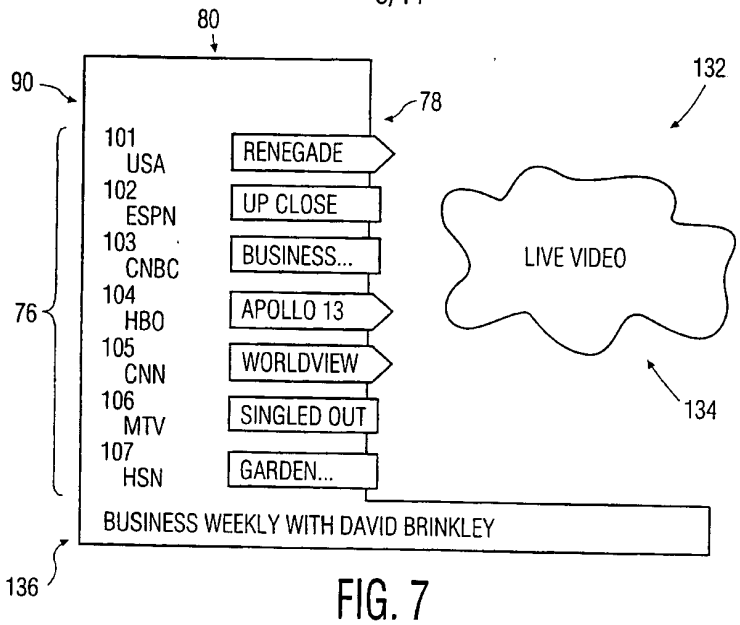

FIG. 7

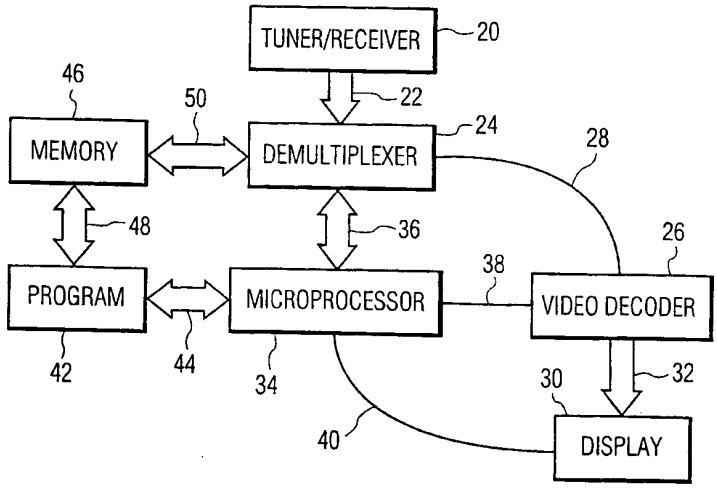

FIG. 8

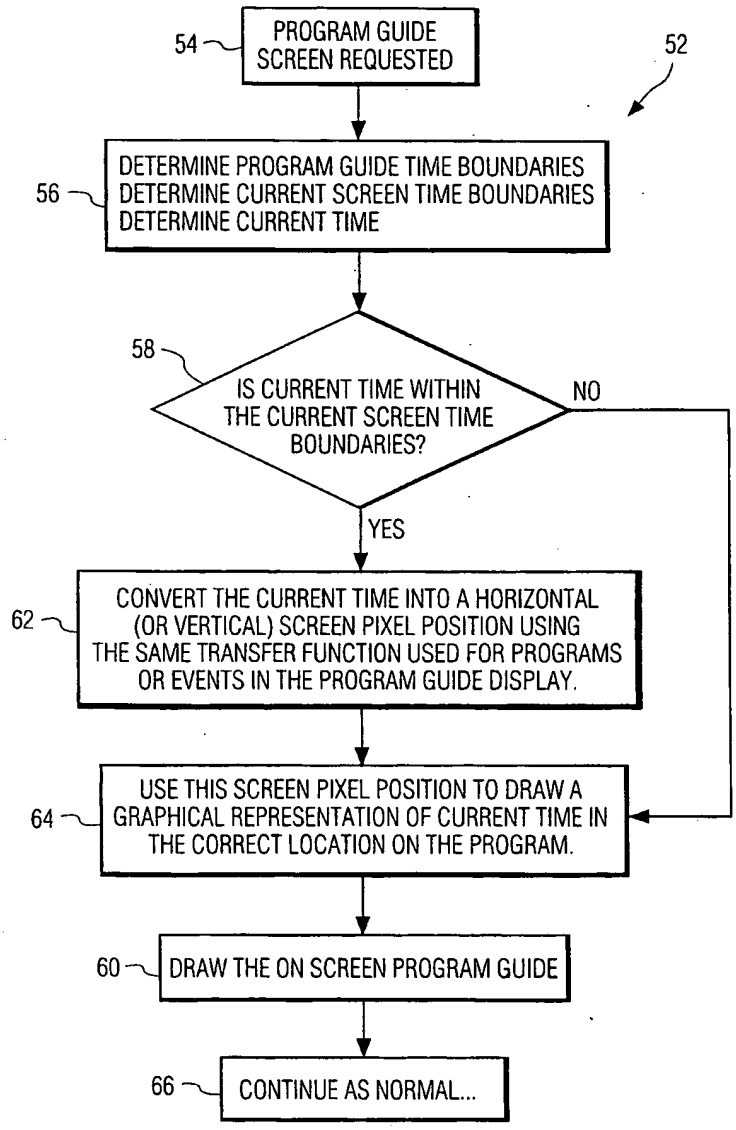
54
PROGRAM GUIDE SCREEN REQUESTED
52
56
DETERMINE PROGRAM GUIDE TIME BOUNDARIES
DETERMINE CURRENT SCREEN TIME BOUNDARIES
DETERMINE CURRENT TIME
58
IS CURRENT TIME WITHIN THE CURRENT SCREEN TIME BOUNDARIES?
NO
YES
62
CONVERT THE CURRENT TIME INTO A HORIZONTAL (OR VERTICAL) SCREEN PIXEL POSITION USING THE SAME TRANSFER FUNCTION USED FOR PROGRAMS OR EVENTS IN THE PROGRAM GUIDE DISPLAY.
64
USE THIS SCREEN PIXEL POSITION TO DRAW A GRAPHICAL REPRESENTATION OF CURRENT TIME IN THE CORRECT LOCATION ON THE PROGRAM.
60
DRAW THE ON SCREEN PROGRAM GUIDE
66
CONTINUE AS NORMAL...

FIG. 9

```
u_int16 GGGridRowToPixel (ui_object * this_op, u_int8 row) {
        gggrid * obj;

        obj = (gggrid *) this_op;
        return ((u_int16) (obj->top_grid_position + (row * obj->row_height)) );
}
int16 GGGridTimeToPixel (ui_object * this_op, int32 time) {
        gggrid * obj;
        int16 pixel;

        obj = (gggrid *) this_op;
        if (time < obj->left_time)
                {
                pixel = -(obj->left_grid_position);
                }
        else if (time > obj->left_time + obj->width_minutes)
                {
                pixel = -(obj->left_grid_position + \
                        (u_int16)((obj->width_minutes * obj->pixels_per_time_unit)/
                        obj->minutes_per_time_unit));
                }
        else
                {
                pixel = ((obj->left_grid_position + \
                        (u_int16)(((time - obj->left_time) * obj->pixels_per_time_unit)/
                        obj->minutes_per_time_unit)) );
                }
        return pixel;
        }

        void GGCreateCurrentTimeLineInGuide(void) {
                int32 current_time;
                Rect box;

                /* put the current time line on the guide */
                /* set the position of the current time cursor */
                current_time = GGScreenCurrentTime(UiFather((ui_object *)obj));
                if ((current_time >= obj->left_time) &&
                        (current_time <= obj->left_time + obj->width_minutes))
                        { /* current time is on the screen, show cursor */
                        UiShapeVisible(obj, TIME_LINE) = TRUE;
                        box.left = (GGGridTimeToPixel ((ui_object *) obj, current_time) & -1);
                        box.right = box.left + 2;
                        box.top = GGGridRowToPixel ((ui_object *) obj, ());
                        box.bottom =
                                ((shape_info *) UiShapeInfo(obj, BACKGROUND)) ->box.area.bottom;
                        BoxSetBounds (UiShpae(obj, TIME_LINE) , &box);
                        }
                else
                        { /* current time is not on the screen, hide cursor */
                        UiShapeVisible(obj, TIME_LINE) = FALSE;
                        }
        }
```

70

FIG. 10

INTERNATIONAL SEARCH REPORT

Inter onal Application No
PCT/US 99/05966

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04N5/445

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category '	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97 49242 A (STARSIGHT TELECAST INCORPORATED) 24 December 1997 see page 4, line 4 - line 20 see page 28, line 23 - page 29, line 9 ---	1-5, 8-11, 15-18,21
X	WO 97 13368 A (STARSIGHT TELECAST INCORPORATED) 10 April 1997 see page 31, line 1 - line 19 ---	1-5, 8-11, 15-18,21
X	US 5 585 838 A (MICROSOFT CORPORATION) 17 December 1996 see column 13, line 17 - line 37 --- -/--	1-3,8,9, 16,17,21

[X] Further documents are listed in the continuation of box C. [X] Patent family members are listed in annex.

' Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 July 1999	20/07/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Verschelden, J

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Inter. ...nal Application No
PCT/US 99/05966

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 95 01058 A (APPLE COMPUTER INC.) 5 January 1995 see page 40, line 1 - page 42, line 5 see page 55, line 12 - page 59, line 6	1-5, 8-11, 14-18,21
A	WO 96 17473 A (TV GUIDE ON SCREEN) 6 June 1996 see page 11, line 3 - page 12, line 6	1-3,8, 14-17

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter ional Application No
PCT/US 99/05966

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9749242 A	24-12-1997	AU 3223097 A	07-01-1998
WO 9713368 A	10-04-1997	AU 7387196 A	28-04-1997
		CA 2232003 A	10-04-1997
		CN 1200221 A	25-11-1998
		EP 0880856 A	02-12-1998
		JP 10512420 T	24-11-1998
US 5585838 A	17-12-1996	NONE	
WO 9501058 A	05-01-1995	US 5594509 A	14-01-1997
		AU 7114394 A	17-01-1995
WO 9617473 A	06-06-1996	US 5629733 A	13-05-1997
		AU 700527 B	07-01-1999
		AU 4502296 A	19-06-1996
		BR 9509826 A	30-09-1997
		CA 2204765 A	06-06-1996
		EP 0806112 A	12-11-1997
		JP 10510120 T	29-09-1998